Electronic Supplementary Information

**Fluorescent linear CO\(_2\)-derived poly(hydroxyurethane) for cool white LED**

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Figure S1. $^1$H NMR spectrum of TMDSPOMD (400 MHz, CDCl$_3$).

Figure S2. $^{13}$C NMR spectrum of TMDSPOMD (101 MHz, CDCl$_3$).
**Figure S3.** $^{13}$C-DEPT 135 NMR spectrum of TMDSPOMD (101 MHz, CDCl$_3$).

**Figure S4.** $^1$H NMR spectrum of BDOMDO (400 MHz, CDCl$_3$).
Figure S5. $^{13}$C NMR spectrum of BDOMDO (101 MHz, CDCl$_3$).

Figure S6. $^{13}$C-DEPT 135 NMR spectrum of BDOMDO (101 MHz, CDCl$_3$).
**Figure S7.** $^1$H NMR spectrum of P1 (400 MHz, CDCl$_3$). The ratio of primary hydroxyl group and secondary hydroxyl group is 1:1.97.

**Figure S8.** $^{13}$C NMR spectrum of P1 (101 MHz, CDCl$_3$).
Figure S9. $^{13}$C-DEPT 135 NMR spectrum of P1 (101 MHz, CDCl$_3$).

Figure S10. HSQC NMR spectrum of P1 (101 MHz, CDCl$_3$).
Figure S11. $^1$H NMR spectrum of P2 (400 MHz, CDCl$_3$). The ratio of primary hydroxyl group and secondary hydroxyl group is 1:2.33.

Figure S12. $^{13}$C NMR spectrum of P2 (101 MHz, CDCl$_3$).
Figure S13. $^{13}$C-DEPT 135 NMR spectrum of P2 (101 MHz, CDCl$_3$).

Figure S14. HSQC NMR spectrum of P2 (101 MHz, CDCl$_3$).
Figure S15. $^1$H NMR spectrum of P3 (400 MHz, $d_6$-DMSO). The ratio of Primary hydroxyl group and secondary hydroxyl group is 1:2.08.

Figure S16. $^{13}$C NMR spectrum of P3 (101 MHz, $d_6$-DMSO).
**Figure S17.** $^{13}$C-DEPT 135 NMR spectrum of P3 (101 MHz, $d_6$-DMSO).

**Figure S18.** HSQC NMR spectrum of P3 (101 MHz, $d_6$-DMSO).
Figure S19. $^1$H NMR spectrum of P4 (400 MHz, $d_6$-DMSO). The ratio of Primary hydroxyl group and secondary hydroxyl group is 1:1.62.

Figure S20. $^{13}$C NMR spectrum of P4 (101 MHz, $d_6$-DMSO).
Figure S21. $^{13}\text{C}$-DEPT 135 NMR spectrum of $\textbf{P4}$ (101 MHz, $d_6$-DMSO).

Figure S22. HSQC NMR spectrum of $\textbf{P4}$ (101 MHz, $d_6$-DMSO).
Figure S23. TGA curves of FPHUs ($T_d,_{5wt.\%}=259^\circ C$, $258^\circ C$, $265^\circ C$, $238^\circ C$, with a heating rate of $10^\circ C \text{ min}^{-1}$ under $N_2$ atmosphere).

Figure S24. PL spectra of FPHUs in ethanol with the same mole structural unit.
**Figure S25.** $^1$H NMR spectrum of P5 (400 MHz, CDCl$_3$).

**Figure S26.** $^{13}$C NMR spectrum of P5 (101 MHz, CDCl$_3$).
Figure S27. $^{13}$C-DEPT 135 NMR spectrum of P5 (101 MHz, CDCl$_3$).

Figure S28. HSQC NMR spectrum of P5 (101 MHz, CDCl$_3$).
Figure S29. FT-IR spectra of P2 and P4.

Figure S30. GPC curves of P1 at different time.
Figure S31. GPC curves of P2 at different time. Insert: linear fitting curve of P2 in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).

Figure S32. GPC curves of P3 at different time. Insert: linear fitting curve of P3 in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).
**Figure S33.** GPC curves of P4 at different time. Insert: linear fitting curve of P4 in ethanol with different molecular weights (Y-axis: the logarithm of fluorescence intensity at 440 nm).

**Figure S34.** PL spectra of P1 in ethanol at different concentrations. Insert: liner relationship of fluorescence intensity at 440 nm versus the concentrations of P1.
Figure S35. (a,b) Size distribution of P1 with 40% (a) and 50% (b) water ($f_{\text{water}}$) fractions measured by DLS.

Figure S36. Blue-to-red spectral composition of the bulk P1.
Figure S37. Emission spectra of the WLEDs under different working voltages.

Figure S38. CIE 1931 chromaticity diagram for the WLED.